

# Edexcel Chemistry A-Level

## Core Practical 08 - Enthalpy change using Hess's Law

### Flashcards

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# What is Hess's Law?



## What is Hess's Law?

- The enthalpy change for a chemical reaction is the same no matter which route is chosen to get from reactants to products.
- (For a Hess cycle, the total enthalpy change clockwise = the total enthalpy change anticlockwise)



# What is the weighing by difference technique?



## What is the weighing by difference technique?

- It is a method to weigh materials accurately.
- $\text{Mass of substance} = \text{Mass of weighing dish and substance} - \text{Mass of dish after substance has been transferred.}$



How can you reduce the uncertainty in the mass measurement?



How can you reduce the uncertainty in the mass measurement?

- Use a balance with a greater resolution.
- Use a larger mass.



What is percentage uncertainty and how do you calculate it?





What is percentage uncertainty and how do you calculate it?

Percentage uncertainty in a measurement =

$$100 \times \frac{\textit{absolute uncertainty}}{\textit{calculated value}}$$



Why can the enthalpy change of a thermal decomposition reaction not be measured directly?



Why can the enthalpy change of a thermal decomposition reaction not be measured directly?

As thermal energy must be supplied for the reaction to occur, the temperature change measured is not only due to decomposition.



# How do you calculate enthalpy change experimentally?



# How do you calculate enthalpy change of reaction experimentally?

- $q = mc\Delta T$
- Where  $m$  is the mass of the solution that changes temperature ( $1\text{g} = 1\text{cm}^3$ ),  $c$  is the specific heat capacity (usually of water) and  $\Delta T$  is the temperature change, measured using a thermometer and  $q$  is the heat energy taken in or released (in joules).
- Divide this number, in kJ, by the number of moles of the limiting reactant.
- Add a sign to show whether  $\Delta H_r^\ominus$  is exothermic or endothermic.



Why may an experimental value for enthalpy change be different to the theoretical value?



Why may an experimental value for enthalpy change be different to the theoretical value?

1. Heat loss to apparatus/surroundings.
2. Incomplete combustion.
3. Non-standard conditions.
4. Evaporation of alcohol/water.



How do you prevent heat loss to surroundings/apparatus?





## How do you prevent heat loss to surroundings/apparatus?

- Insulate by placing the reactants in a polystyrene cup with a lid, into the beaker.
- Avoid large temperature differences between surroundings and calorimeter.
- Use a bomb calorimeter



Other than preventing heat loss, how can the accuracy of this experiment be improved?



## Other than preventing heat loss, how can the accuracy of this experiment be improved?

- Read the thermometer at eye level to avoid parallax errors.
- Stir the solution so the temperature is evenly distributed.
- Use a digital thermometer and data logger for more accurate and faster readings.
- Use greater concentrations and masses, leading to a greater temperature change and thus smaller uncertainty.



# What is accuracy?



# What is accuracy?

The more accurate the data, the closer it is to the actual value.

